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STUDENTS' ATTITUDE TOWARDS DIFFERENT EVALUATION METHODS IN PHARMACOLOGY

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ABSTRACT
Literature review suggests the importance and the need of students' feedback which may be used to effectively reform evaluation methods in medical sciences. The present study has been conducted to obtain student's attitude (perception of) towards different evaluation methods of pharmacology. The sample consisted of second phase M.B.B.S (n=108) students. Students answered 115 items/questions designed according to Likert's five point (in agreement with items) scale. These items/questions assessed student's attitude (perception of) towards different constituents of evaluation methods of pharmacology like sessional exams, traditional practical exams, objective structured practical exam (OSPE), MCQs, long essays, viva voce, pharmacy practical exercise, experimental pharmacology exercise etc in relation with various aspects of pharmacology subject like understanding, retention, learning clinical applications, mechanism of action of drugs, pharmacological actions, therapeutic uses, prescribing drugs etc. Results of the present study indicated the degree to which each evaluation method like sessional/preliminary theory exams, traditional practical exams and OSPE helps to elicit different constituents of pharmacology subject (ex: mechanism of action of drugs, therapeutic uses etc) and the reason for the same is discussed. Similarly usefulness of different constituents of theory exams (MCQs, long essay etc) and practical exams (spotters, pharmacy exercises etc) towards eliciting the understanding pharmacology is revealed. Present study indicated the merits and demerits of different evaluation methods used in pharmacology. If any reformations/changes have to be incorporated in the evaluation methods, outcomes of this study will definitely help towards improving/modifying the evaluation methods of teaching and learning of pharmacology subject.
Keywords: Attitude, Evaluation methods, Pharmacology, Undergraduates.

INTRODUCTION

A curriculum is a vision and road map to achieve the academic objectives. Pharmacology teaching is focused more on factual information with little or no emphasis on clinical and applied aspects[1]. Pharmacology is a crucial discipline for medical students who are going to be future doctors. It is important that medical students appreciate pharmacological principles and are able to apply them in the practice of medicine[2]. In UG medical curriculum, the basic aim of teaching pharmacology is to give adequate pharmacokinetic, pharmacodynamic and therapeutic information on a large number of drugs in current use. Training in professional skills enables a student to perform his/her expected duties which include: 1) Communication skills, 2) Prescription writing skills, 3) Critical appraisal skills and 4) Community-related skills[3]. In the last two decades a number of educational programs have been developed to improve the teaching and learning of pharmacology and therapeutics[4,5]. Practical exercises in pharmacology should include: Demonstration of dosage forms and some commonly used and easily made medicaments (e.g. ORS powder, Aspirin, Antibiotic solution), Demonstration and practice of parenteral routes of drug administration especially in view of WHO's observations on unsafe injection practices in India, Assessment of pharmaceutical promotional materials, decision making in actual or simulated clinical situations, practical demonstration of certain clinical or emergency procedure, identification and use of various sources of drug information, preparations of ideal formularies, preparation and review of information sheets and package inserts and interpretations of clinical trial reports[6].

Problems have been noted with objective structured practical examinations (OSPE) viz., time constraint, logistical problems, maintaining uniform difficulty levels, shortage of observers, observer fatigue etc[7]. In fact, the need of the hour is teaching reformation from the same old traditional methods of teaching[8]. Students should develop 'transferable skills', which are important, not only in undergraduate medical education but also for continued learning throughout their medical career[9].Total reliance on a final exam is inadvisable as such equal importance should be given to continuous assessment on the basis of objectively structured techniques[9].

It is being increasingly recognized that attitudinal aspects deserve as much attention in any training programme as is given to knowledge so that optimum benefits can be derived[10,11]. The students are in the best position to comment on the effectiveness of any teaching system and they may be regarded as the best judges to assess the teaching and evaluation methods[12]. Improvement has been noted after implementation of suggestions obtained from students[12].The course assessment instruments like feedback may help to know about the pros and cons of teaching and assessment methods[12]. Frequent feedback may help teachers plan the curriculum and improve upon the teaching and assessment methods. Hence, it is very essential to synchronize teaching and evaluation methods with special requirements of medical students[13,14].

Literature review suggests the importance of students' feedback which may be used to effectively modify evaluation methods in pharmacology subject. So the present study is planned to obtain students' feedback/attitude towards different evaluation methods in pharmacology. By the end of the study it can be known whether the present evaluation methods of pharmacology

are effective or not. If yes, how much? and in which way?. i.e. to analyse the merits and demerits of each evaluation method.

Objectives: The present study was carried out to obtain Students' attitude (holistic) towards the evaluation methods of pharmacology at Department of Pharmacology, J.N.M.C. and Students' attitude (perception) towards different constituents of evaluation methods in regard to subtopics of pharmacology subject.

MATERIALS AND METHODS

This is an experimental study. The sample consisted of second phase M.B.B.S (n=108) students. Different topics of pharmacology subject have been taught/covered through different teaching methods throughout one and a half year during second phase M.B.B.S. Students appear for different sessional, preliminary theory (including viva) as well as practical exams (formative assessments or low stakes exams) before they take up the final university examination (summative assessment or high stakes exams). Theory assessment/exam consists of two written question papers each with maximum marks of 100. Each question paper is divided into different sections viz., MCQs (25 marks), Long essays (10X2=20 marks), Short essays (8X5=40 marks) and Short answers (5X3= 15 marks). Viva voce consists of total 40 marks adding to the theory section. Students have to appear for Practical exams consisting total of 80 marks. The practical exams are divided into Spotters (10 marks), Prescription exercise which involves writing a prescription for the given clinical condition/case (5X2=10 marks), Criticise and rewrite on a given wrong prescription or a combination preparation (5 marks), Therapeutic problem (5 marks), Pharmacy exercise (20 marks) where students have to prepare and label a pharmacy preparation like Condy's lotion etc., Experimental pharmacology exercise (20 marks) consisting of animal experiments like identifying the effect of given mydriatics or miotics in rabbit's eyes, Interpretation of a given graph(10 marks) like tachyphylaxis, vasomotor reversal of dale phenomenon etc. The present study has been conducted after the preliminary exams just before the final university examination. Students' assessment of retaining, recalling and reproducing skills of different evaluation methods in pharmacology has been obtained by using different questionnaires with 5 point scale designed according to Likert's scale[15]. The respondents are required to indicate their agreement or otherwise with each item by ticking one of the five alternatives viz., strongly agree, agree, neither agree or disagree, disagree and strongly disagree. Items have been formed for different evaluation methods in pharmacology viz., Sessional and Preliminary theory exams, Traditional practical exams and OSPE. Questions (items) like, each evaluation method that is mentioned above helps to elicit the holistic understanding/learning of pharmacology as well as to elicit different constituents of the pharmacology subject viz., General introduction, Pathophysiology of the disease, Classification of drugs, Pharmacological actions, Mechanism of Action, Preparations/doses/brand names, Adverse drug reactions, Resistance development in case of Antimicrobial agents (AMA) or Antibiotics, Contraindications, Precautions, Interactions and Therapeutic uses. Similar questions/items have been designed to know the attitude/perception of students on different constituents of evaluation methods like MCQs, Long essays, Short essays, Short answers (constituents of theory question papers), Viva voce, Spotters, Prescription writing, Comment and rewrite, Therapeutic problem, Pharmacy exercise, Experimental pharmacology exercise, Interpretation of graph (constituents of practical exams) and Problem based learning (PBL) exercise. Each student has answered the items/questions in an answer paper (response sheet) provided to him/her. An open ended questionnaire was also used. The answer papers are corrected by the chief investigator.

Ethics: Voluntary consent from each student to participate in the study is taken. Ethical clearance from the Institutional Ethics Committee for Human Subjects is taken. Ethical clearance number is MDC/782 letter dated 16/12/2011 from JNMC Institutional Ethics Committee on Human Subjects Research.

FEEDBACK FORM (Open ended questions)
I. What factors facilitate your learning: 1.....2..... 3.....
II.What factors hinder your learning: 1.....2.....3.....
III.Suggestions for improvements in future: 1.....2.....3.....

Student's signature

The data has been collected after correcting the answer papers (response sheets) of the students (respondents). This data has been summarised and the results have been analyzed by using standard statistical tests. $P<0.05$ is considered as significant.

Attitude tests regarding helpfulness of various evaluation methods towards holistic understanding of pharmacology (Table 1-5)

Table 1. Following evaluation method helps to elicit cognitive knowledge of pharmacology.

(n=108)	Strongly Agree (SA)	Agree (A)	Neither agree or disagree (NA or D)	Disagree (D)	Strongly disagree (SD)
Sessional and Preliminary	33.33% (36)	31.48%(34)	23.14%(25)	10.18%(11)	1.85%(2)
Traditional practical exams	17.15% (20)	34.29%(40)	36.01%(42)	1.71%(2)	3.43%(4)
OSPE	22.22% (24)	25.00%(27)	30.55%(33)	17.59%(19)	4.62%(5)
Chi-square:26.89, df: 8, ***p < 0.001					

Table 2. Following evaluation method helps to elicit retention of the subject. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary	11.11%(12)	38.89%(42)	33.33%(36)	12.04%(13)	4.63%(5)
Traditional practical exams	14.81%(16)	25.93%(28)	37.96%(41)	17.59%(19)	3.70%(4)
OSPE	15.74% (17)	25.00%(27)	34.26%(37)	16.67%(18)	8.33%(9)
Chi-square:9.226, df: 8, p > 0.05					

Table 3. Following evaluation method is helpful to pass the final (high stakes) exam. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary	17.59% (19)	34.26%(37)	30.56%(33)	14.81%(16)	2.78%(3)
Traditional practical exams	17.59% (19)	29.63%(32)	37.04%(40)	11.11%(12)	4.63%(5)
OSPE	18.52% (20)	25.93%(28)	35.19%(38)	12.04%(13)	8.33%(9)
Chi-square:5.923, df: 8, p > 0.05					

Table 4. Following evaluation method helps to elicit clinical applications. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary	12.96% (14)	35.19%(38)	31.48%(34)	16.67%(18)	3.70%(4)
Traditional practical exams	12.96% (14)	26.85%(29)	35.19%(38)	17.59%(19)	7.41%(8)
OSPE	12.96% (14)	27.78%(30)	30.56%(33)	18.52%(20)	10.19%(11)
Chi-square:5.228,df: 8, p > 0.05					

Table 5. Following evaluation method is helpful in the long run. (n =108)

	SA	A	NA or D	D	SD
Sessional and Preliminary	12.96% (14)	24.07%(26)	38.89%(42)	12.96%(14)	11.11%(12)
Traditional practical exams	13.89% (15)	23.15%(25)	38.89%(42)	12.04%(13)	12.04%(13)
OSPE	10.19% (11)	22.22%(24)	35.19%(38)	14.81%(16)	17.59%(19)
Chi-square:3.272,df: 8, p > 0.05					

Attitude tests regarding helpfulness of various evaluation methods towards eliciting different aspects of pharmacology (Table 6-15)

Table 6. Following evaluation method helps to elicit understanding of general introduction/history of drugs.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	10.19% (11)	40.74% (44)	35.19% (38)	10.19% (11)	3.70% (4)
Traditional practical exams	14.81% (16)	38.89 % (42)	30.56% (33)	10.19% (11)	5.56% (6)
OSPE	17.59% (19)	26.85% (29)	28.70% (31)	16.67% (18)	10.19% (11)
Chi-square:12.52, df:8, p > 0.05					

Table 7. Following evaluation method helps to elicit understanding of pathophysiology of diseases.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	8.33% (9)	37.96% (41)	37.96% (41)	12.04% (13)	3.70% (4)
Traditional practical exams	9.26% (10)	37.04% (40)	36.11% (39)	12.96% (14)	4.63% (5)
OSPE	11.11% (12)	33.33% (36)	26.85% (29)	18.52% (20)	10.19% (11)
Chi-square:9.216, df:8, p > 0.05					

Table 8. Following evaluation method helps to elicit understanding of classification of drugs. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary exams	18.52% (20)	33.33% (36)	32.41% (35)	13.89% (15)	1.85% (2)
Traditional practical exams	13.89% (15)	32.41% (35)	33.33% (36)	15.74% (17)	4.63% (5)
OSPE	19.44% (21)	12.96% (14)	41.67% (45)	17.59% (19)	8.33% (9)
Chi-square:18.666,df:8, **p < 0.01					

Table 9. Following evaluation method helps to elicit understanding of pharmacological actions of drugs.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	12.96% (14)	40.74% (44)	26.85% (29)	17.59% (19)	1.85% (2)
Traditional practical exams	13.89% (15)	37.96% (41)	25.00% (27)	21.30 % (23)	1.85% (2)
OSPE	11.11% (12)	30.56% (33)	22.22% (24)	23.15% (25)	12.96% (14)
Chi-square:19.296, df:8, **p < 0.01					

Table 10. Following evaluation method helps to elicit understanding of mechanism of action of drugs.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	14.81% (16)	32.41% (35)	30.56% (33)	13.89% (15)	8.33% (9)
Traditional practical exams	11.11% (12)	32.41% (35)	32.41% (35)	12.96% (14)	11.11 % (12)
OSPE	14.81% (16)	23.15% (25)	31.48% (34)	15.74 % (17)	14.81% (16)
Chi-square:5.196,df:8, p > 0.05					

Table 11. Following evaluation method helps to elicit understanding of preparation of the drugs

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	16.67% (18)	37.04 % (40)	29.63% (32)	12.96% (32)	3.70% (4)
Traditional practical exams	25.93% (28)	29.63% (32)	26.85% (29)	13.89 % (15)	3.70% (4)
OSPE	21.30% (23)	28.70% (31)	19.44% (21)	21.30% (23)	9.26% (10)
Chi-square:12.765,df:8, p > 0.05					

Table 12. Following evaluation method helps to elicit adverse drug reactions. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary exams	13.89% (15)	35.19% (38)	35.19% (38)	12.04 % (13)	3.70% (4)
Traditional practical exams	9.26% (10)	41.67% (45)	31.38% (34)	16.67% (18)	0.93 % (1)
OSPE	15.74% (17)	25.93 % (28)	30.56 % (33)	19.44% (21)	8.33% (9)
Chi-square:15.088,df:8, *p < 0.05					

Table 13. Following evaluation method helps to elicit resistance development in case of Antimicrobial agents.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary exams	12.96% (14)	25.93% (28)	37.96% (41)	17.59% (19)	5.56% (6)
Traditional practical exams	9.26% (10)	41.67% (45)	33.33% (36)	13.89% (15)	1.85% (2)
OSPE	10.19% (11)	27.78% (30)	28.70% (31)	16.67 % (18)	16.67% (18)
Chi-square:23.661,df:8, **p < 0.01					

Table 14. Following evaluation method helps to elicit contraindications/precaution/ interactions of drugs.

(n=108)	SA	A	NA or D	D	SD
Sessional and Preliminary	15.74% (17)	31.48% (34)	31.48% (34)	18.52 % (20)	2.78 % (3)
Traditional practical exams	13.89% (15)	30.56% (33)	30.56 % (33)	18.52 % (20)	6.48% (7)
OSPE	14.81% (16)	27.78% (30)	24.07% (26)	22.22 % (24)	11.11% (12)
Chi-square:7.664,df:8, p > 0.05					

Table 15. Following evaluation method helps to elicit therapeutic uses. (n=108)

	SA	A	NA or D	D	SD
Sessional and Preliminary exams	17.59% (19)	38.89% (42)	29.63 % (32)	12.04% (13)	1.85% (2)
Traditional practical exams	23.15% (25)	36.11% (39)	26.85% (29)	11.11% (12)	2.78% (3)
OSPE	19.44% (21)	27.78% (30)	27.78% (30)	18.52% (20)	6.48% (7)
Chi-square:9.157, df:8, p > 0.05					

Attitude tests regarding helpfulness of various constituents of theory examination/evaluation of pharmacology (Table 16-20)

Table 16. Following evaluation method helps to elicit cognitive knowledge of pharmacology.

(n=108)	SA	A	NA or D	D	SD
MCQs	27.78%(30)	34.26%(37)	26.85%(29)	4.63%(5)	6.48%(7)
Long essays	30.56%(33)	34.26%(37)	24.07%(26)	11.11%(12)	0.00%(0)
Short essays	27.78%(30)	26.85%(29)	38.89%(42)	5.56%(6)	0.93%(1)
Short answers	27.78%(30)	37.96%(41)	21.30%(23)	12.04%(13)	0.93%(1)
Viva voce	25.93%(28)	28.70%(31)	29.63%(32)	12.96%(14)	2.78%(3)
Frequent sessional exams	22.22%(24)	30.56%(33)	34.26%(37)	9.26%(10)	3.70%(4)
Chi-square:31.82, df:20, *p<0.05					

Table 17. Following evaluation method helps to elicit retention of the subject. (n=108)

	SA	A	NA or D	D	SD
MCQs	13.89%(15)	40.74%(44)	35.19%(38)	7.41%(8)	2.78%(3)
Long essays	21.30%(23)	36.11%(39)	29.63%(32)	12.96%(14)	0.00%(0)
Short essays	15.74%(17)	36.11%(39)	37.04%(40)	9.26%(10)	1.85%(2)
Short answers	23.15%(25)	37.96%(41)	31.48%(34)	7.41%(8)	0.00%(0)
Viva voce	15.74%(17)	43.52%(47)	27.78%(30)	11.11%(12)	1.85%(2)
Frequent sessional exams	18.52%(20)	30.56%(33)	30.56%(33)	17.59%(19)	2.78%(3)
Chi-square:21.90, df:20, p>0.05					

Table 18. Following evaluation method is helpful to pass the final (high stakes) examination.

(n=108)	SA	A	NA or D	D	SD
MCQs	25.93%(28)	30.56%(33)	31.48%(34)	7.41%(8)	4.63%(5)
Long essays	24.07%(26)	33.33%(36)	31.48%(34)	10.19%(11)	0.93%(1)
Short essays	16.67%(18)	39.81%(43)	35.19%(38)	6.48%(7)	1.85%(2)
Short answers	24.07%(26)	34.26%(37)	29.63%(32)	121.04%(13)	0.00%(0)
Viva voce	16.67%(18)	37.96%(41)	31.48%(34)	10.19%(11)	3.70%(4)
Frequent sessional exams	15.74%(17)	35.19%(38)	32.41%(35)	12.96%(14)	3.70%(4)
Chi-square:18.63,df:20, p>0.05					

Table 19. Following evaluation method helps to elicit clinical application of pharmacology knowledge.

(n=108)	SA	A	NA or D	D	SD
MCQs	15.74%(17)	32.41%(35)	34.26%(37)	12.04%(13)	5.56%(6)
Long essays	14.81%(16)	39.81%(43)	25.00%(27)	15.74%(17)	4.63%(5)
Short essays	14.81%(16)	37.96%(41)	28.70%(31)	14.81%(16)	3.70%(4)
Short answers	22.22%(24)	34.26%(37)	30.56%(33)	9.26%(10)	3.70%(4)
Viva voce	10.19%(11)	40.74%(44)	32.41%(35)	11.11%(12)	5.56%(6)
Frequent sessional exams	14.81%(16)	36.11%(39)	29.63%(32)	16.67%(18)	2.78%(3)
Chi-square:13.61, df:20, p>0.05					

Table 20. Following evaluation method is helpful in the long run. (n=108)

MCQs	23.15%(25)	28.70%(31)	29.63%(32)	11.11%(12)	7.41%(8)
Long essays	21.30%(23)	27.78%(30)	30.56%(33)	14.81%(16)	5.56%(6)
Short essays	17.59%(19)	29.63%(32)	37.04%(40)	12.96%(14)	2.78%(3)
Short answers	22.22%(24)	31.48%(34)	25.00%(27)	17.59%(19)	3.70%(4)
Viva voce	15.74%(17)	29.63%(32)	38.89%(42)	11.11%(12)	4.63%(5)
Frequent sessional exams	20.37%(22)	32.41%(35)	28.70%(31)	14.81%(16)	3.70%(4)
Chi-square:13.17, df:20, p>0.05					

Attitude tests regarding helpfulness of various constituents of practical examination/evaluation of pharmacology (Table 21-25)

Table 21. Following evaluation method helps to elicit cognitive knowledge of pharmacology.

(n=108)	SA	A	NA or D	D	SD
Spotters	24.07%(26)	36.11%(39)	29.63%(32)	5.56%(6)	4.63%(5)
Prescription writing	19.44%(21)	39.81%(43)	33.33%(36)	5.56%(6)	1.85%(2)
Comment and rewrite	22.22%(24)	31.48%(34)	31.48%(34)	11.11%(12)	3.70%(4)
Therapeutic problem	21.30%(23)	34.26%(37)	30.5%(33)	12.04%(13)	1.85%(2)
Pharmacy practical exercise	14.81%(16)	32.41%(35)	38.89%(42)	10.19%(11)	3.70%(4)
Experimental pharmacology	18.52%(20)	38.89%(42)	32.41%(35)	7.41%(8)	2.78%(3)
Interpretation of graph	22.22%(24)	31.48%(34)	26.85%(29)	13.88%(15)	5.56%(6)
PBL exercise	21.30%(23)	25.93%(28)	25.93%(28)	15.74%(17)	11.11%(12)
Chi-square:35.571,df: 28, p>0.05					

Table 22. Following evaluation method helps to elicit retention of the subject. (n=108)

	SA	A	NA or D	D	SD
Spotters	16.67%(18)	38.89%(42)	32.41%(355)	9.26%(10)	2.78%(3)
Prescription writing	20.37%(22)	31.48%(34)	42.59%(46)	5.56%(6)	0.00%(0)
Comment and rewrite	18.52%(20)	36.11%(39)	26.85%(29)	17.59%(19)	0.93%(1)
Therapeutic problem	17.59%(19)	33.33%(36)	35.19%(38)	12.04%(13)	1.85%(2)
Pharmacy practical exercise	12.04%(13)	33.33%(36)	35.19%(38)	18.52%(20)	0.93%(1)
Experimental pharmacology	16.67%(18)	25.93%(28)	43.52%(47)	11.11%(12)	2.78%(3)
Interpretation of graph	17.59%(19)	28.70%(31)	32.41%(35)	14.81%(16)	6.48%(7)
PBL exercise	17.59%(19)	24.07%(26)	31.48%(34)	16.67%(18)	10.19%(11)
Chi-square: 54.462,df: 28, ***p< 0.001					

Table 23. Following evaluation method is helpful to pass the final (high stakes) examination.

(n = 108)	SA	A	NA or D	D	SD
Spotters	23.15%(25)	28.70%(31)	39.81%(43)	6.48%(7)	1.85%(2)
Prescription writing	19.44%(21)	39.81%(43)	32.41%(35)	6.48%(7)	1.85%(2)
Comment and rewrite	18.52%(20)	31.48%(34)	31.48%(34)	15.74%(17)	2.78%(3)
Therapeutic problem	22.22%(24)	29.63%(32)	33.33%(36)	12.96%(14)	1.85%(2)
Pharmacy practical exercise	19.44%(21)	25.00%(27)	37.04%(40)	16.67%(18)	1.85%(4)
Experimental pharmacology	16.67%(18)	21.30%(23)	44.44%(48)	13.89%(15)	3.70%(4)
Interpretation of graph	20.37%(22)	30.56%(33)	31.48%(34)	12.96%(14)	4.63%(5)
PBL exercise	21.30%(23)	25.00%(27)	27.78%(30)	17.59%(19)	8.33%(9)
Chi-square:38.319, df:28, p>0.05					

Table 24. Following evaluation method helps to elicit clinical application of pharmacology knowledge.

(n=108)	SA	A	NA or D	D	SD
Spotters	15.74%(17)	34.26%(37)	34.26%(37)	10.19%(11)	5.56%(6)
Prescription writing	16.67%(18)	37.96%(41)	33.33%(36)	10.19%(11)	1.85%(2)
Comment and rewrite	21.30%(23)	37.04%(40)	26.85%(29)	13.89%(15)	0.93%(1)
Therapeutic problem	21.30%(23)	33.33%(36)	27.78%(30)	14.81%(16)	2.78%(3)
Pharmacy practical exercise	8.33%(9)	34.26%(37)	37.96%(41)	16.67%(18)	2.78%(3)
Experimental pharmacology	15.74%(17)	23.15%(25)	41.67%(45)	14.81%(16)	4.63%(5)
Interpretation of graph	20.37%(22)	27.78%(30)	29.63%(32)	14.81%(16)	7.41%(8)
PBL exercise	15.74%(17)	25.93%(28)	28.70%(31)	17.59%(19)	12.04%(13)
Chi-square:46.399, df:28, **p < 0.01					

Table 25: Following evaluation method is helpful in the long run. (n=108)

	SA	A	NA or D	D	SD
Spotters	18.52%(20)	27.78%(30)	27.78%(30)	19.44%(21)	6.48%(7)
Prescription writing	17.59%(19)	28.70%(31)	34.26%(37)	13.89%(15)	5.56%(6)
Comment and rewrite	15.74%(17)	31.48%(34)	32.41%(35)	16.67%(18)	3.70%(4)
Therapeutic problem	20.37%(22)	25.93%(28)	36.11%(39)	12.04%(13)	5.56%(6)
Pharmacy practical exercise	13.89%(15)	26.85%(29)	39.81%(43)	15.74%(17)	3.70%(4)
Experimental pharmacology	16.67%(18)	19.44%(21)	42.59%(46)	16.67%(18)	4.63%(5)
Interpretation of graph	21.30%(23)	26.85%(29)	25.93%(28)	19.44%(21)	6.48%(7)
PBL exercise	24.07%(26)	14.81%(16)	34.26%(37)	12.96%(14)	13.89%(15)
Chi-square:36.735, df:28, p>0.05					

RESULTS AND DISCUSSION

Results of the present study indicate that to what extent preparing and appearing for presently used different evaluation methods in pharmacology like sessional/preliminary exams, traditional practical exams and OSPE are helpful in learning pharmacology in holistic aspects. These holistic attitude tests revealed that preparing and appearing for sessional and preliminary exams, traditional practical exams and OSPE, in the descending order, help in better understanding of pharmacology subject and are useful to pass the final exam {significant ($p<0.001$) difference was noted between various evaluation methods} [Table 1 and 3]. Preparing and appearing for sessional and preliminary exams, OSPE and traditional practical exams helped better, in the descending order, in retention of pharmacology subject [Table 2]. Clinical application can be learnt better by preparing and appearing for sessional and preliminary exams, OSPE and traditional practical exams in the descending order [Table 4]. Present results are in agreement with earlier report that traditional practical exercises may not test the clinical applications[16]. Preparing and appearing for traditional practical exams, sessional and preliminary exams and OSPE, in the descending order, are useful in the long run [Table 5]. The degree to which the evaluation methods like sessional/preliminary theory exams, traditional practical exams and OSPE help to elicit different constituents of pharmacology subject have been revealed by the results. Traditional practical exams, sessional/preliminary exams and OSPE, in the descending order, help in eliciting the General introduction (history etc) [Table 6], Patho-physiology of the diseases [Table 7], Preparations of the drugs [Table 11], Adverse drug reactions [Table 12], Resistance development in case of antimicrobial drugs (significant difference, $p<0.01$) [Table 13] and Therapeutic uses [Table 15].

Different exercises of traditional practical exams (rated high by the students) which might help/correlate to elicit various constituents of pharmacology subject is given in parenthesis viz., General introduction (spotters), Patho-physiology of the diseases (prescription writing, therapeutic problem, comment and rewrite), Preparations/doses/brand names of the drugs (prescription writing, therapeutic problem, comment and rewrite), Adverse drug reactions(comment and rewrite, graphs), Resistance development in case of antimicrobial drugs (comment and rewrite), Therapeutic uses of various drugs (spotters, prescription writing, comment and rewrite, therapeutic problem, pharmacy exercise, experimental pharmacology exercise, graph). Sessional and preliminary exams, Traditional practical exams and OSPE elicit, in the descending order, details about Classification of the drugs (significant difference, $p<0.01$) [Table 8], Pharmacological actions (significant difference, $p<0.01$) [Table 9], Mechanism of drugs [Table 10], Contraindications/precautions/interactions [Table 14]. Similarly, why the sessional/preliminary exams, have been rated higher in eliciting the following constituents of pharmacology is discussed i.e. the evaluation methods which contribute to the same is given in parenthesis viz., details about classification of the drugs (MCQs, long essays), pharmacological actions (long essays, short essays, short answers), mechanism of action of drugs (MCQs, long essays, short essays, short answers),contraindications/precautions/interactions (MCQs, long essays, short answers), selection of drug/drug of choice (MCQs, short answers). Similarly, to what extent the different constituents of theory exam (including viva voce) help in eliciting various aspects of pharmacology subject is indicated by the results which are self explanatory (i.e. shown in tables). Cognitive knowledge of pharmacology is better elicited by Short answers, Long essays, MCQs, Short essays, Viva voce, Frequent sessional exams in the descending order {significant ($p<0.05$) difference was noted between different constituents of theory evaluation methods} [Table 16]. Short answers,Viva voce, Long essays, MCQs, Short essays, Frequent sessional exams in the descending order elicited retention of the subject [Table 17]. Short answers, Long essays, MCQs, Short essays, Viva-voce and Frequent sessional exam in the descending order were useful to pass the final (high stakes) examination [Table 18]. Clinical application of the pharmacology knowledge is better elicited by Short answers, Long essays, Short essays, frequent Sessional exams, Viva-voce and MCQs in the descending order [Table 19]. Short answers, frequent sessional exams, MCQs, Long essays, Short essays and Viva-voce in the descending order were helpful in the long run [Table 20]. To what extent the different constituent exercises of traditional practical exam elicit various aspects of pharmacology is indicated by the results which are again self explanatory (shown in tables). Spotters, Prescription writing, Experimental pharmacology exercise, Therapeutic problems, Comment and rewrite, Interpretation of graph, PBL exercise and Pharmacy exercise elicit cognitive knowledge of pharmacology in the descending order [Table 21]. Spotters, Comment and rewrite, Prescriptions writing, Therapeutic problems, Interpretation of graph, Pharmacy exercise, Experimental pharmacology and PBL exercise elicited retention of the subject in the descending order {significant ($p<0.001$) difference was noted between different constituents of practical evaluation methods} [Table 22]. Prescription writing, Spotters, Therapeutic problem, Interpretation of graph, Comment and rewrite, Experimental pharmacology, PBL exercise and Pharmacy exercise in the descending order help to pass the final (high stakes) exams [Table 23]. Comment and rewrite, Therapeutic problems, Prescriptions, Spotters, Interpretation of graph, Pharmacy exercise, PBL exercise, Experimental pharmacology exercise elicit clinical application of pharmacology knowledge (significant difference, $p<0.01$) in the descending order [Table 24]. Similarly, in the descending order, Interpretation of graph, Comment and rewrite, Therapeutic problem, Spotters, Prescription writing, Pharmacy exercise, PBL exercise and Experimental pharmacology are useful in the long run [Table 25]. Analysis of open ended questions (Feedback forms) indicated that frequent exams and MCQs were the factors which facilitated learning of pharmacology. Involvement of more number of drugs in the subject hindered the learning. Suggestions for improvements in

future were: to increase the hours of OSPE training[17], to increase the use of MCQs, to introduce sophisticated instruments in practicals, to give gap of a day in between theory papers during exams, to increase the frequency of sessional exams and to reduce the use of animals in practical due to humanitarian reasons. Present study indicated the merits and demerits of different evaluation methods used in pharmacology. Health science programmes have an ethical responsibility to ensure that reliable and valid assessment tools are utilised. All assessments in medical education require evidence of validity (usually assessment scores) to be interpreted meaningfully[18]. Threats to validity may be in the form of Construct Under representation (CU) and Construct Irrelevant Variance (CIV)[19]. Reliability, validity, feasibility and acceptability have to be considered when evaluating the efficacy of any assessment protocol[18]. If any reformations/changes have to be brought in to the evaluation methods, this study will help in improving evaluation methods of teaching and learning in pharmacology subject.

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